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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Mark T. Girard et al.	**Examiner:**	Kim, P.
Serial No.:	10/073,600	**Group Art Unit:**	3729
Filed:	February 11, 2002		
For:	HEAD GIMBAL ASSEMBLY METHOD	**Docket No.:**	AKI0004/US/2

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Commissioner for Patents
P.O. Box 1450
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I CERTIFY THAT ON 10 March 2005, THIS PAPER IS BEING DEPOSITED WITH THE U.S. POSTAL SERVICE AS FIRST CLASS MAIL IN AN ENVELOPE ADDRESSED TO MAIL STOP APPEAL BRIEF-PATENTS, COMMISSIONER FOR PATENTS, P.O. BOX 1450, ALEXANDRIA, VA 22313-1450.

Renee A. Wolff
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APPEAL BRIEF

Dear Sir:

The above referenced patent application includes claims that have been finally rejected by a Final Official Action dated September 30, 2004. Applicants have appealed from the decision of the Examiner to the Board of Patent Appeals and Interferences by a Notice of Appeal, which was received in the United States Patent and Trademark Office on January 10, 2005. Accordingly, this Appeal Brief is timely filed within the shortened-statutory period for filing such Appeal Brief. Enclosed is a check in the amount of $250.00 for the small entity fee for filing this Appeal Brief. Should any further fee be required, the Commissioner is hereby authorized to charge Kagan Binder Deposit Account No. 50-1775 and thereafter notify us of the same.

Table of Contents

I. Real Party in Interest

Applied Kinetics, Inc., the assignee of record, is the real party in interest.

II. Related Appeals and Interferences

There are no related appeals or interferences.

III. Status of Claims

Claims 1-14 are pending in the present application.

Claims 1 and 12 stand rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 5,901,016 to Iwamoto.

Claims 2 and 8-10 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,901,016 to Iwamoto in view of U.S. Patent No. 5,896,247 to Pan et al.

Claims 3-5 and 7 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,901,016 to Iwamoto in view of U.S. Patent No. 5,896,247 to Pan et al., and further in view of U.S. Patent No. 5,588,200 to Schudel.

Claim 13 stands rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,901,016 to Iwamoto in view of U.S. Patent No. 5,588,200 to Schudel.

Claim 14 stands rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,901,016 to Iwamoto in view of U.S. Patent No. 5,588,200 to Schudel and further in view of U.S. Patent No. 5,896,247 to Pan et al.

Claims 6 and 11 are objected to as being dependent on a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

IV. Status of Amendments

On December 30, 2004, claim 14 was amended in response to the Final Official Action dated September 30, 2004. The Examiner entered this amendment for the purposes of appeal as indicated in the Advisory Action dated January 18, 2005. No other amendments were proposed after Final Rejection.

V. Summary of Claimed Subject Matter

The present invention, as recited in claims 1, 12, and 13, relates generally to methods for assembling a head gimbal assembly. Claims 1, 12, and 13 each recite steps of attaching a head/slider to a flex circuit to form a gimbal assembly, electrically coupling the head/slider to the flex circuit, and attaching the gimbal assembly to a suspension. Claim 12 additionally recites that the head/slider is attached to an insulation layer of the flex circuit. Claim 13 includes the additional step of determining the static angle of the gimbal assembly.

In a first step of the invention as recited in claims 1, 12, and 13, a head/slider 100 is attached to a circuited gimbal 102 as shown in Figure 3. Assembling the head/slider 100 to the circuited gimbal 102 results in the air bearing not being placed relative to the load point, since the suspension is not yet present. Attachment of the head/slider 100 to a circuited gimbal 102 presents several advantages over the current assembly procedure of attachment of the head/slider 100 to a completed suspension/flex circuit assembly. First, the attachment operation is simplified because the circuited gimbal is a relatively flat, substantially two-dimensional structure. The flex circuit typically comprises a base polyimide material with the electrical leads laid thereon. Such a flex circuit usually includes a cover material also made out of polyimide. Thus, the flex circuit is substantially planar with a small thickness. Consequently, the head/slider 100 can be pushed flat against the circuited gimbal without worry about adversely affecting static attitude of the completed suspension assembly.

Next, a termination pad 122 of the head/slider is electrically connected to an electrical lead 120 of the flex circuit with a ball 140 as shown in Figures 2 and 3. The advantages over conventional methods of terminating leads to sliders without the presence of suspensions are numerous. First, since the suspension is not present during this operation and vision is utilized, fixturing is simplified and thus provides flexibility, low maintenance, and low cost. Second, better clamping and substrate heating can promote improved bonding quality. Third, as with the process of bonding the head/slider 100 to the circuited gimbal 102, because of the flat, predominately two-dimensional structure of the head/suspension circuited gimbal assembly, the tooling needed to hold such assemblies can be flat and requires only the use of rough locating features. This significantly reduces the complexity of the tooling, increases its compatibility

with other part configurations, and enables bonding to occur with no static attitude damage. Fourth, the use of a vision system to locate the termination targets provides accurate bond placement. Accurate termination placement is aided by the accurate lead to pad alignment already performed in the previous process of bonding the head/slider to circuited gimbal. In conventional slider attachment processes, the main objective is to align the head/slider with the suspension's load point or dimple. This conventional method, however, does not guarantee good pad to lead alignment, which may cause poor termination. In the inventive process, head/slider termination is done independent of the presence of a suspension. Therefore, the main objective is pad to lead alignment and; hence, good termination. The alignment of the head/slider to the suspension occurs at a separate post termination process.

VI. Grounds of Rejection to be Reviewed on Appeal

I. Whether Figure 1 of U.S. Patent No. 5,901,016 to Iwamoto, which is characterized as an exploded view for illustration purposes in the Brief Description of the Drawings section, discloses any particular sequence of assembling a head suspension, in particular the sequence of assembly as recited in independent claims 1 and 12, and where the specification of the Iwamoto reference only structurally describes the components illustrated in Figure 1 with reference only to assembly in a conventional manner and no further specific comment on the manner or sequence of assembly of such components.

II. Whether the Iwamoto reference discloses attaching a slider to an insulation layer of a flex circuit as recited in claim 12.

III. Whether U.S. Patent No. 5,588,200 to Schudel, as used to modify the head suspension assembly of U.S. Patent No. 5,901,016 to Iwamoto, suggests determining the static angle of the head/slider circuited gimbal assembly prior to the step of attaching the head/slider circuited gimbal assembly to the suspension as recited in independent claim 13.

VII. Argument

I. Figure 1 of U.S. Patent No. 5,901,016 to Iwamoto does not teach the claimed sequence of assembling a head suspension as recited in claims 1 and 12.

A. Claims 1 and 12 recite a sequential method of assembling a head suspension.

The Examiner argues that claims 1 and 12 do not recite a specific sequential method. It appears that the Examiner has not given any patentable weight to the specific claim language regarding this fundamental issue throughout the entire prosecution of the present patent application. For example, the Examiner again argues in the Advisory Action of January 18, 2005, that there is no sequential order recited in claims 1 and 12. Specifically, the Examiner notes "there is no sequential order in the claimed invention such as prior to."

The preamble of claims 1 and 12 reads as, "A method ... comprising the following steps *performed in the following order*:" (emphasis added). Thus, the preamble of claims 1 and 12 positively limits the scope of claims 1 and 12 and such limitation must be considered by the Examiner in determining the patentability of claims 1 and 12. The Federal Circuit has indicated that a preamble limits a claim if it recites essential structure or steps, or if it is "necessary to give life, meaning, and vitality" to the claim. *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d at 1305 (Fed.Cir.1999). Here, the language "performed in the following order" is essential to the meaning of claims 1 and 12 and therefore limits the scope of claims 1 and 12.

B. Figure 1 of the Iwamoto reference does not teach the specific patentable sequential order of assembling a head gimbal assembly recited in claims 1 and 12 because the purpose of Figure 1 of the Iwamoto reference is to illustrate the structural features of the components illustrated in Figure 1 and because the specification of the Iwamoto reference does not provide any specific comment on the manner or sequence of assembly of such components other than to use conventionally known techniques.

The Examiner's interpretation of the Iwamoto reference is not consistent with the disclosure and teachings within this reference. One of ordinary skill in the art would clearly understand that the Figures of the Iwamoto reference are provided for illustration purposes as expressly stated in the specification so as to preclude other interpretations of what is shown. The purpose of the Figures of the Iwamoto reference is to illustrate the structure of the electrical connection and nothing more, especially any order of assembly of the slider, flex circuit, and suspension. Importantly, Figure 1 is characterized in the "Brief Description of the Drawings" section as being a view "with the flexible conductive laminate conductor shown *separated for clarity of* illustration" (emphasis added). This characterization of Figure 1 is repeated in the specification at column 3, lines 58 and 59 further emphasizing that the Figures of the Iwamoto reference are provided to illustrate the structural features of the electrical connector between the signal circuitry and the slider. The term "separated" explicitly means that the drawing shows the assembly after it has been fully assembled (which assembly manner is not taught, other than as conventionally done at that time) followed by a separation for illustrative purposes. How can the drawing suggest an assembly process where it is clearly noted as being an illustration showing separated components after assembly for explanation of component features? Such use of separated views is well known and common for exactly such explanation purposes. To say that the separated view of Figure 1 teaches any specific assembly sequence, as argued by the Examiner, is completely contrary to express language of the drawing description and to the well established understanding of illustration techniques and nomenclature.

According to the Examiner, the Iwamoto reference anticipates claims 1 and 12 by teaching attaching a slider to a flex circuit and electrically connecting the slider to the flex circuit before attaching the flex circuit to a suspension. The Examiner argues that because no sequence of assembly is taught in the specification of the Iwamoto reference, any sequence of assembly can be used, and the Iwamoto reference therefore teaches any such sequence of assembly. In a plainly conclusory manner the Examiner finds the presently claimed assembly steps in a disclosure that does not teach any new assembly steps at all and drawings that show a head suspension that has been taken apart to illustrated structural features. To say any assembly drawing teaches all possible assembly sequences is clearly contrary to U.S. patent law. Without

any further recitation of assembly methods or procedures or other prior art references showing conventional or well known methods, it is submitted that the disclosure of Iwamoto is entirely deficient of any suggestion to first attach a slider to a flex circuit, then electrically connect the slider to an electrical lead of the flex circuit, and then attach the flex circuit assembly to a suspension in that order as presently claimed.

Moreover, the steps recited in claims 1 and 12 and the specific order in which the recited steps are carried out are not normal and obvious procedures for assembling a head suspension. One test for patentability of a process claim is whether or not the steps and the specific order in which they are carried out, as recited in the claims, are normal and obvious procedures for making the article. *Ex Parte Kaul*, 125 USPQ 70. The present invention is directed to a method of assembling a head gimbal assembly as a sequence of steps performed in a specific inventive order, as set out in claims 1 and 12. First, a slider is attached to a flex circuit to form a flex circuit assembly. Next, the slider is electrically connected to an electrical lead of the flex circuit. Finally, the flex circuit assembly is attached to a suspension. As set out in detail in the specification of the present application, there are multiple advantages to this sequence of assembling the head gimbal assembly. Many of these advantages are achieved because attachment of the slider to the flex circuit *and* attachment of the slider to the electrical lead of the flex circuit are accomplished *prior to* the attachment of these components to a suspension.

The order of assembly recited in claims 1 and 12 is not a normal and obvious procedure for making a head gimbal suspension and the Examiner has not provided any evidence in support thereof. Absent applicant's disclosure, there is simply no teaching of such an order of assembly in the Iwamoto reference. In fact, as recognized by the Examiner, the Iwamoto reference does not teach any order of assembly at all for assembling the slider, flex circuit, and suspension other than to note that an advantage of the invention is that conventional techniques can be used. Specifically the Iwamoto reference teaches that an advantage of the flexible circuit type flexure of the Iwamoto reference is that it can be "handled with known manufacturing processes, including placement and welding." See column 3, lines 24-27. This is because the focus of the Iwamoto reference is not the order of assembly of these components but the

structure of the electrical connection between the slider and the signal circuitry. See column 3, lines 52-53, for example. Moreover, the presentation of a drawing view showing a head suspension assembly that has been taken apart in order to illustrates structural features of the head suspension assembly suggests that the assembly would be done differently.

In view of the above arguments, the rejection of independent claims 1 and 12 should be reversed.

II. The Iwamoto reference does not teach attaching a slider to an insulation layer of a flex circuit as recited in claim 12.

Independent claim 12 further recites that the slider is attached to an insulating layer of the flexible circuit in an otherwise similar sequential assembly as in claim 1. Such limitation further distinguishes from the Iwamoto reference in that Iwamoto clearly states that the slider 32 is mounted to the central tongue 38 of the flexure 14. Moreover, Figure 1 shows a flexible conductive laminate 42 having edge 56. The slider 32 is clearly not attached to the conductive laminate 42 as it is spaced from the edge 56. Thus, even in the situation where a flexure (or other element of metal or the like) can be a part of a gimbal assembly as set out in claim 12, the slider of Iwamoto is attached to the metal tongue and not to an insulating layer of a flexible circuit and thus cannot anticipate or suggest such. Thus, in addition to the above distinction regarding the claimed sequential assembly, Iwamoto is also deficient as compared to claim 12 in that the recited attachment of a slider to an insulation layer of a flex circuit is missing. The other cited references including the Pan et al. reference and the Schudel reference do not overcome the basic deficiencies of the Iwamoto reference. None of the art of record suggests the attachment of a head slider to a flexible circuit physically and electrically prior to the attachment of the slider/flexible circuit combination to the suspension.

In view of the above arguments the rejection of independent claim 12 should be reversed.

II. Modifying U.S. Patent No. 5,901,016 to Iwamoto in view of U.S. Patent No. 5,588,200 to Schudel as proposed by the Examiner does not teach determining the static angle of the head/slider circuited gimbal assembly prior to the step of attaching the head/slider circuited gimbal assembly to the suspension as recited in independent claim 13.

In the Final Official Action of September 30, 2004, the Examiner correctly identifies that the Iwamoto reference does not teach a process of determining the static angle of a suspension prior to the process of attaching a head/slider circuited gimbal assembly to the *suspension*. The Examiner thus proposes that it would be obvious to modify the Iwamoto reference in light of the Schudel reference on the basis that the Schudel reference teaches measuring the static angle of a *load beam* (the main metal load translating component of a head suspension assembly, normally combined with a flexure to permit slider gimballing) without a flexure attached thereto. However, this has absolutely no relevance to what is claimed. That is, even if one could modify Iwamoto in view of Schudel, any such combination would not arrive at the present invention as claimed in claim 13. Specifically, claim 13 recites "determining the static angle of the *head/slider circuited gimbal assembly* prior to the step of attaching the head/slider circuited gimbal assembly to the suspension." How does measuring the static angle of a load beam component of a head suspension before a flexure is attached to the suspension provide a teaching to measure a static angle of a head/slider. Measuring a static angle of a load beam has nothing to do with suggesting measuring a flex circuited gimbal assembly at all, much less as presently claimed, within a specific sequence of assembly. Moreover, Schudel fails to disclose measuring the static angle of any type of flexure, particularly a circuited flexure, before attaching the flexure to the suspension.

In view of the above arguments, the rejection of independent claim 13 should be reversed.

Respectfully Submitted,

Dated: 10 MARCH 05

By: _____

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VIII. Appendix - Claims on Appeal

1. A method of assembling a head gimbal assembly comprising the following steps performed in the following order:
attaching a head/slider having at least one termination pad to a flex circuit having at least one electrical lead to produce a head/slider circuited gimbal assembly having at least one static angle;
electrically connecting the at least one termination pad of the head/slider to the at least one electrical lead of the flex circuit; and
attaching the head/slider circuited gimbal assembly to a suspension having at least one static angle.

2. The method of claim 1 and further including:
determining the at least one static angle of the head/slider circuited gimbal assembly after the step of electrically connecting the at least one termination pad of the head/slider to the at least one electrical lead of the flex circuit.

3. The method of claim 2 and further including:
determining the at least one static angle of the suspension prior to the step of attaching the head/slider circuited gimbal assembly to the suspension.

4. The method of claim 3 and further including performing a dynamic electrical test on the head/slider circuited gimbal assembly prior to determining the at least one static angle of the suspension.

5. The method of claim 4 and further including determining an offset between the head/slider circuited gimbal assembly prior to attaching the head/slider circuited gimbal assembly to the suspension.

6. The method of claim 5 wherein said offset is determined according to the following formula:

$$X = -(\Theta_{\text{Circuited Gimbal}} * k_{\text{Circuited Gimbal}} + \Theta_{\text{Suspension Flexure}} * k_{\text{Suspension Flexure}})/F_{\text{Gram}} - X_0$$

where

$\Theta_{\text{Circuited Gimbal}}$ = static angle of the HSCG assembly;

$k_{\text{Circuited Gimbal}}$ = stiffness of the HSCG assembly;

$\Theta_{\text{Suspension Flexure}}$ = static angle of the suspension;

$k_{\text{Suspension Flexure}}$ = stiffness of the suspension;

F_{Gram} = Gram Load; and

X_0 = the product of the gram load and the load point shift.

7. The method of claim 1 and further including:

determining the at least one static angle of the suspension prior to the step of attaching the head/slider circuited gimbal assembly to the suspension.

8. The method of claim 1 and further including performing a dynamic electrical test on the head/slider circuited gimbal assembly prior to determining the at least one static angle of the suspension.

9. The method of claim 8 wherein said dynamic electrical test is performed by flying the head/slider circuited gimbal assembly over a rotating media disk.

10. The method of claim 1 and further including determining an offset between the head/slider circuited gimbal assembly prior to attaching it to the suspension.

11. The method of claim 10 wherein said offset is determined according to the following formula:

$$X = -(\Theta_{\text{Circuited Gimbal}} * k_{\text{Circuited Gimbal}} + \Theta_{\text{Suspension Flexure}} * k_{\text{Suspension Flexure}})/F_{\text{Gram}} - X_0$$

where

$\Theta_{\text{Circuited Gimbal}}$ = static angle of the HSCG assembly;

$k_{\text{Circuited Gimbal}}$ = stiffness of the HSCG assembly;

$\Theta_{\text{Suspension Flexure}}$ = static angle of the suspension;

$k_{\text{Suspension Flexure}}$ = stiffness of the suspension;

F_{Gram} = Gram Load; and

X_0 = the product of the gram load and the load point shift.

12. A method of assembling a head gimbal assembly comprising the following steps performed in the following order:
attaching a head/slider having at least one termination pad to an insulation layer of flex circuit having at least one electrical lead to produce a head/slider circuited gimbal assembly having at least one static angle;
electrically connecting the at least one termination pad of the head/slider to the at least one electrical lead of the flex circuit; and
attaching the head/slider circuited gimbal assembly to a suspension having at least one static angle.

13. A method of assembling a head gimbal assembly comprising the following steps:
attaching a head/slider having at least one termination pad to a flex circuit having at least one electrical lead to produce a head/slider circuited gimbal assembly having a static angle;
electrically connecting the at least one termination pad of the head/slider to the at least one electrical lead of the flex circuit;
attaching the head/slider circuited gimbal assembly to a suspension having at least one static angle; and
determining the static angle of the head/slider circuited gimbal assembly prior to the step of attaching the head/slider circuited gimbal assembly to the suspension.

14. The method of claim 13 wherein the determining step comprises determining the static angle of the head/slider circuited gimbal assembly after the step of electrically connecting the at least one termination pad of the head/slider to the at least one electrical lead of the flex circuit, and further comprising the step of determining the static angle of the suspension prior to the step of attaching the head/slider circuited gimbal assemble to the suspension.